Brains in the Flesh. Prospects for a neurophenomenology

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The relations between the neurosciences and phenomenology enable us today, thanks to the works of M. Merleau-Ponty, G. Simondon, F. Varela, A.R. Damasio and V.S. Ramachandran, to define the brain as a biosubjective organ: its constitution, its functioning, and its interactions prove that a description of individuation can fit in a cognitive neurophenomenology. In this framework, the mental state acquires a subjective autonomy even if it is an illusion in regard to the determining conditions of the brain functioning.

Relations between phenomenology and the neurosciences, which appear to be impossible in principle, have now focused on the question of the "cognitive body." This notion refers to the presence, in that part of organized matter termed the body, of intentional elements for organizing the treatment of information. Perception and action both belong to and work on this cognitive body. Now, the development of these two disciplines, phenomenology and the neurosciences, may have been independent and even antagonistic, but the description of the bounds between body and brain has now become an obligation for philosophy. In what she called "neurophilosophy," Patricia Churchland (P.S. Churchland 1986) had proposed an eliminativist solution: the neurosciences would be sufficient to explain the constitution of the body by means of the natural basis of the brain, without any reference to phenomenology.

I critiqued this type of reductionist reasoning because another description of the construction of the body is possible: the interaction of the body with its environment begins in the formation of the nervous system by the different levels of plasticity (Andrieu, 1998). Neural plasticity is the experimental proof that determinism is not strict in the development of the body. Phenomenology performs the distinction between the lived body and the subjective body and at the same time enables a new description thereof, including biology and neurobiology.

The publication of the notes of Merleau-Ponty's last lectures at the Collège de France between 1956-1960 (F. Evans, S. Lawlor eds., 2000) provides a new basis on which to launch a phenomenological approach to the relations between the body, the brain and the world. The 1957-58 lecture

on the concept of Nature examines the trends of modern biology. Coming back to this analysis of behaviour, Merleau-Ponty uses the book by G.E. Coghill, *Anatomy and the problem of behavior* in 1929, to set the principles of dynamic anatomy against strict behaviorism.

Strict determinism would have summed up nervous conduction to a univocal information. But after examination of the work on embryology, which belongs to the model of neurobiology of development (M. Reuter, 1999, 73), Merleau-Ponty writes:

> The nervous system emerges from a preneural dynamic. Thus when the nervous excitation occurs, it can't play an important role in the organization of the nervous system. This organization is not so much due to the functioning of the neuron as to the growth of the total organism. The preneural system of integration "strides across" the nervous functioning and it doesn't stop when it appears. So the nervous system can't be the ultimate explanation. Then we must admit an intrinsic potentiality of growth, a dynamic system reacting to its surroundings as an organism would do. It replaces the function of conduction as being a consequence, not a principle of the system. (Merleau-Ponty, 1995, 192).

Merleau-Ponty emphasizes the reciprocal character of the notion of body and the notion of behaviour whereas A.R. Damasio (1999) sets it between the body and the brain.

In his last lecture, "Nature and Logos: The human body" (1960), Merleau-Ponty says the human body is the place where Nature emerges into ontological layers. The body is subject of movement and subject of perception. This theory of the flesh formulates a coiling up of the body-object on itself, thanks to which it is touching/touched, visible/invisible. Thus the organism is not simply its psychochemical reality, because the flesh of the body could be understood from the modes of constitution of the human body (A.F. Ashbaugt, 1978). The neurophenomenology (F. Varela, 1996) is a new perspective in the philosophy of embodied mind (F. Varela, E. Thompson, E. Rosch, 1991).

The publication of *Notes de cours* confirms how much Merleau-Ponty remained haunted by the link between biology and phenomenology (D. Borrett, S. Kelly, H. Kwan, 2000). His translation of and comment upon the *Beilage* XXII of the *Krisis* is the opportunity to find in Husserl the incarnation of consciousness from biology.

What I propose to call the *flesh* (A. Ainley, 1997) of the brain defines the historic construction of the nervous system through the interaction of the body with the world and the progressive embodiment of these incorporations. To think the body which enables me to think the body. Vicious circle or badly put question? If we keep on distinguishing what enables us to think the body from the thought object, then we won't be able to think the body thinking. For we must admit as man's existential presupposition that without the body, there is no thinking; we must come back to the description of the internal relationships of the body with its thought in order to found dynamic materialism, but neurophilosophy (P.S. Churchland, 1986) has popularized a strictly reductionist version (Andrieu B., 1998). I argue that we should instead have a philosophy of neuroscience (Gold, I. & Stoljar, D. 1999, 827) because there is an epistemological distinction between philosophy and neuroscience.

The role of interaction

The human body must be first understood as in interaction with its environment because it is itself the receptive matter both informed and informing. The human body is not a monad but has a temporal character in phenomenology (Sara Heinämaa, 1999, 58). If isolated from the world, it is unable to build itself up, for nature has only endowed it with potentialities that have to meet the circumstances of an environment to become actual. As an interface, the body doesn't remain passive: it doesn't obey the orders of the nervous system in a servile manner, neither is it an objective reflection of the world. Failing to be this recording chamber, according to the mechanical metaphor, the human body is the way in and out, through which the inside communicates with the outside (and vice-versa). This crossing is subjectifying in the sense that the matter of the body is the result of this building up interaction. By "subjectifying" I mean the movement which singularizes each human body by successive incorporations. Subjectivity is a result, in continuous movement, of adaptation and regulation. The human body is subjectivized as soon as its conception by the mother and child's interactions. Nothing completely objective can be known, thus making the knowledge of the world relative to each human body. Each one's relativity doesn't preclude scientists from approximately establishing a temporary truth on the human body.

This knowledge remains approximate because of the very constitution of the body: the sensation is felt through the nervous structure in the body so that two human bodies can never feel the same intensity for the same object. Psychometrics, modernized by electrophysiology, quantifies the quality of the experiences of what has been lived by the body: this method establishes an objective knowledge by measuring the times of reaction, the thresholds of perception. But the visualization of electric exchanges will never tell anything about the way the body feels them in itself. If neurosciences have a good knowledge of the body's functioning, they describe the biological side as being felt psychophysiologically or even exclusively psychologically by the body itself.

The distinction between levels of description does not lead to a new dualism since one could not exist without the other. Should the body owe its activities to the strict application of neuronal networks, nevertheless, the contents of the thought make the subject believe in a natural illusion of independence from the matter of his body. Our point is not to deny the determining character of matter in body functioning but to refuse the reduction of the organ to the function.

By the esthesiology of the body proper, two human bodies can never feel the same intensity for the same object. This impossible intersubjectivity holds the bodies (C. Lefort, 1991) out of themselves and each body in itself, making it difficult to express linguistically what has been lived esthesiologically. The lack of objectivity is constituent of any human body's relations with the world. At least any human body can be described from outside as an objective structure but the neurobiology of development must describe a process of subjective individuation rather than draw out a universal type of incorporation.

The notion of plasticity explains this adaptability of the human body to its environment, each body being a single body. So the body appropriates the information of its senses and the brain processes it. The brain is not the center of cognition but the necessary way to it. Does the physico-chemical transformation of nervous information presuppose a reduction of quality? The conversion of what is felt into nervous material is nonstop: the sum of the visual neurons produces the picture I see, the tips of my finger are nothing but the polished surface of the sensitive nerves. The human flesh (D. Lever, 1990) works at transforming and giving a definite shape to the physico-chemical matter of information. The flesh is proposed as a category, which, standing between soul and body, grounds the possibility of their relation (J.

Mensch, 1994). But for the description of the flesh, we must go beyond the oppressive nature of binary terms, body and mind (D. Enns, 1995).

Which individuation?

The physical and scientific 'dividuation' is the opposite of what G. Simondon called the psychic individuation. In describing ontogenesis, his aim is to explain the individual through individuation. Thus individuation is not an antecedent stage preceding the appearance of the individual being. Psychic individuation could be understood as a means of fighting against the physical dividuation of the human body. For, by offering the shapes, modes and degrees of individuation to replace the individual into the being, G. Simondon wants to renew the scattering of the being caused by the development of human sciences. They multiply psychism but do not manage to define the movement through which the individual comes out as a somato-psychic totality. Faced with the physical dividuation of the human body, psychic individuation would take into account, from a subjective point of view, the individual's capacity to perceive, know and feel the world's totality.

So, coming back to the Bergsonian opposition of time and space, Simondon calls the physical individual what we have discovered as physical *dividuation*. By losing all dynamic balance, his individuality analyses and intervenes on physical elements but the individual can't produce a sufficient activity to stop the reduction of psychic totality to his physical parts.

Psychic individuation, relevant to understand the genesis of the individual, can't resist physical dividuation. Simondon's scientific model, used through notions of "potential," "information," "metastability" and "transductivity" still depends on a biological presupposition whose metaphorical limit was revealed by Jacob (1970). On the contrary, we think that if the individual has problems today with his identity and his unity, the reason is to be found in the change of an informative paradigm to a predictive and programmatic paradigm.

Negative induction or pathological reasoning

The study of dysfunctionings and other anomalies (P.J. Harisson, 1991) is very helpful in understanding the etiologic modes of the body. For interactive individuation depends on the quality of the successive incorporations:

if the reception of incorporations is impaired, the body itself is modified. What is lacking for normal functioning is a guide for the description of the constitutions of the body.

Pathological reasoning shows the cause/effect relation between this matter and these mental shapes. If destroyed or damaged, the physico-chemical matter of our sensitivity can't provide the matter for thinking: or rather, there is a proportional ratio between the quality of sensations and the qualities of mental activities. The body provides the matter for thinking even if the way the thought pictures its mental states is perceived by it as independent.

This illusion of independence is well within the normal functioning of the thinking body but this partial autonomy of thought doesn't prevent it from having the illusion of its independence. While writing these words, I don't feel the direct determination of matter. Are we to conclude, as reductionists have it, that the content of the thought would be the strict application of the state of this matter? Is it because we don't know how the brain really works that we keep the hypothesis of an independence of the thought or does the thought as result of the brain always produce for itself the illusion of this independence? I shall defend the second thesis, because the brain produces thought as extra activity whose causes are complex because of the number of networks involved.

Nobody can deny there is an element of determinism here: the slightest illness confirms by a kind of negative induction the mutual implication of the body and the mind states; the experience of pleasure or pain proves how much the content of my thought can be invaded, even obsessed by the state of my body: thus the erotic image would be caused by hormonal excitation, as some "biologies of the passions" claim (e.g. J.-D. Vincent, 1986); by "caused" we must understand that subjective imagination is offered with this felt sensation the opportunity to be fanciful.

In the same way, the intensity of pain can be such that it forbids any autonomy of thought as if the body dominated and imposed its whole material content on thought. Extreme pain or pleasure are moments when the continuity from body to mind is preserved almost in spite of us. Yet when we go beyond subjective control, it shows the permanent character of this continuity which we don't feel in "normal" life. However the unawareness of the life of the body doesn't put us out of the body.

Thus, imagination leans on biological conditions through humours. The state of the body acts upon the representation and the affects by hormonal intensity. But the content of these dimensions of imagination isn't set

in hormones, contrary to what reductionists who favour "brain medicine" put forward.

The distinction of different levels of explanation acknowledges against dualism the necessary complementarity between the brain and the unconscious, but it poses the problem of the continuity between the two of them. We can't recognize the determining role of biological processes without analyzing the nature and the limit of this determination. Refusing strict determinism because of the difference of level or organization of matter, our philosophy of the thinking body can't expect science to exhaustively describe the functioning of mental states, on the one hand because of the disposition of organic networks, on the other hand because of the lack of an explanation for the change of quantity into quality. We must admit that the complex organization of matter products a superior level of reality, like in an emergence theory. This superiority, due to the results of network activity, seems independent if the mind observes this activity from itself whereas the superiority is just autonomous.

Mental autonomy

This feeling, favoured by the experience of thought, of being out of the bod,y is actually a mental autonomy allowed by the functional coherence of the body. The body keeps on finding in the contents of thought the modes of its representation of the world. It is not thought that thinks itself, or considers itself independent from the body. Mental states produce the "natural illusion" in Kant's sense, of an independence of the mind from the body. By natural we mean that the mind is not conscious of it, and that the body is the cause of it.

However this continuity of oneself in one self doesn't show a homogeneity in levels. Organic dysfunctioning proves that thinking requires certain neurobiological conditions to become conscious of the different levels. For a long time, the criterion of the consciousness of oneself was considered as a limit beyond which there would be no thought: thinking should be reserved to the consciousness of the contents of one's thought (C. Smith, 2001).

But, without going so far as hemispheric division whose purpose is to eliminate the concept of consciousness (the works on the split brain have as their therapeutic aim to prevent the spreading of epilepsy from one hemisphere to the other, and they gave the opportunity to neurophilosophers (G.S. Stent, S.F. Spicker, 1990) to deny the mental unity of consciousness)

we must consider thinking less as a threshold in the cerebral organization than as the very activity of the body.

The notion of threshold, on this view, serves to retain of neurobiological activity nothing but conscious intensity. But the body thinks conscious and unconscious contents from implicit or explicit perceptions. The criterion of the threshold holds dualism where the corporeal matter organizes different levels. The reflex should be understood as the natural unthought of the body itself. From reflex to mental representation, the distinction traditionally made between the voluntary and the involuntary is a criterion of the definition of the thought: what would be human would be set in the voluntary activity of the mind, thus offering freedom and choice. Does acknowledging a determinism of the reflex prevent one from admitting the existence of an unconscious thought of the body? Isn't the reflex a content of thought that we don't think, a corporeal knowledge unthought out and yet determining?

The reflex is a material content unthought whereas reflection is a material content wholly thought. The determinism of the one is necessary to the freedom of the other. Yet it is the same body even if the levels of organization of matter allow the presence or the absence of free activity of the thought.

How can one and the same matter (but is it the same matter?) produce within itself an unthought content and pure thought? We must admit that human matter has different degrees of complexity according to which mental activity is more or less freed from strict natural determinism. Except probably for the reflex level, for which the body is subjected to natural determinism, all the other degrees of the organization of matter depend in their constitution on an interaction between nature and culture.

Thinking matter

The opposition between the innate and the acquired is renewed by cellular and molecular embryology which specifies the conditions of the programmed development and the limited possibilities of plasticity. The matter of which the human body is made becomes the human body as successive incorporations take place (A.R. Damasio, 1994). This *historical* dimension of any human body is a psychosocial propping up: any learning requires a material support to be selected by living matter and thus be used as the informative basis for mental activity.

This mental activity is autonomous for it is allowed by every human body according to the development of its history: the thought goes through the folds and layers of the subjective esthesiology and of the biopsychological memory. The subjective esthesiology depends on the perception of the world, the latter being introduced into the body by the senses. Objective knowledge doesn't exist as every human body must create for itself prototypes built empirically.

Every thought is a coming back of the self to the self which results from the central nervous system going through the body: yet if it is true that every thought is an effect of the thinking body, its contents are not the exact reproduction of the neuronal networks but their subjective production. By subjective production we mean the effect of neuronal networks inside the human body, historically built and with a material organization providing a specific mental activity: incorporation can't be but subjective. Its materialization can't be set in the brain. Cognitive activity is based on maps, networks, neurofunctional areas… rather than on single elements. The gregarious necessity of neuronal collections ensures the communication necessary to the autonomous activity of the thought. When we think, we are not aware of the neuronal networks which however are at work.

This unawareness of our brain gives thought an imaginary independence as long as no damages limit or influence this activity. Mental states must be understood as forms crystallized at some time, chosen or not by the thinking body. The mental picture may as well come from mnesic recomposition as from imaginary composition. It gives the thought its matter with representations of words or things. Yet no materiality could be grasped since the mental image is an immaterial form produced by matter, which seems paradoxical in a materialistic position. How could some matter produce something immaterial? Should the whole thing be different and superior to the sum of the parts?

Maintaining a non-reductionist materialistic position presupposes that one allows for the creation of forms by matter—this position can be described as a *dynamic materialism*. Morphogenesis finds its reason and its dynamism in the matter of the genes of development. In the same way, couldn't we describe mental states as an endogenesis of the matter of the thinking body? Through its networks, the brain produces the form of thought whose content is found in the connection and the conjunction of materials constituting the thinking body. The endogenesis of mental states is to a certain extent (the problem comes from this proportion) similar to the morphogenesis

described by embryology. The building of neuronal networks is submitted to equal biological constraints and the propping up structures of mental states. In order not to reduce the thought to the body, we must admit the body is materially able to produce not only organic forms (body states) and programmatic forms (children) but also ideal forms.

This endogenesis of ideal forms, as worked out by Gilbert Simondon, presupposes their crystallization into a mental state for the thinking body to be able to think them. This crystallization is the product, that we call reflection, of the real dynamics of matter. We must distinguish the subjective representation of the matter of the thinking body from the objective description of it. Not because the subjective representation would be erroneous or would not be able to know anything of the formal reality it has produced. Not because the objective reality of the idea of the thinking body would be, as far as quality is concerned, imperfect compared to the formal reality of its cause: the thinking body itself. But the mental state is a synthetic form of the material dynamics of the thinking body. Without this causality, it couldn't exist, but conversely, without the mental state, the body couldn't be thought. This functional complementarity doesn't introduce a qualitative leap of the body to its thought. The mental state makes the body think whereas the living matter provides by the means of the body the thinking matter.

Mental autonomy is part of the logic of the living because the material conditions of the living produce the conditions of mental representations. The liberation of the cortex-brain and its specific hypertrophy allows the production of mental states.

The illusion of mental localization

The reason why not all neuroscientists will manage to localize the change of the quantitative into the qualitative is that the neurofunctional level of the mental state explains this change in its conditions but never in its contents, except in the case of lesions. The changing of a level of organization to another, whose quality seems heterogeneous in the previous level, can be measured at the time of the visualization of neuronal networks, of the intersynaptic communication of neurotransmitters (G. Edelman, 1987). But this measurement finds a cause-effect relation between the organization of living matter and what would be its effective result. Actually, a direct causality produces a mental state as its dysfunctioning disqualifies the thought of the body. But the thought can't be directly localized as it comes from a dynamic process.

The reductionist illusion consists in fixing this process in several stages or levels of material organization. Yet it is true that a certain level of organization of the matter is needed, below which the production of conscious thought is impossible. Thus nature, in its dynamic evolution, has not produced the same degree of organization. The distinction of nature between animal and man is superseded; it is now time we acknowledged a difference of degree in the organization of the matter. Anthropologists endeavoured to emphasize the role of the human body in the singularity of its mental activity. Without the release of the hand by bipedy and the growth of the brain volume, the interaction of the human body with surroundings wouldn't have been able to create a sociocultural environment where education and speech ensured the classic transmission. The plasticity of ontogenesis made the socialization of the human body possible because cultural factors further collective integration and personal identification. Animals can't be compared to us except if we establish a functional hierarchy. Their bodies manage to define a very limited part of freedom even if the interaction with the environment, provided in their degree of plasticity by Nature, ensures a dynamic dimension.

The specific difference of the human body is to become a thinking body: thinking doesn't lie in a localizable part of the body because the body organizes itself, thinks itself in producing its level of mentalization that we separate in an abstract way by instituting it as thought. The humanization of the body requires a continuous interactive elaboration between environment and body.

Brain plasticity and body construction

From its conception onwards, the human body is a person thanks to the influences it receives from its environment. By isolating consciousness from body sensitivity, some would like to determine the movement of birth of human identity. Yet, even during the forming *in utero*, the fœtus (Lecanuet J.P., Fifer W.P., Krasnegor N.A., eds., 1995) feels and reacts to the food and affects his mother receives (P. Rochat, 2001). When we count the age of a child from his birth, we forget stages already incorporated during intra-uterine life. The human body should be understood as soon as the germinal movement of its matter.

The nervous system, as the base of sensitivity, ceases its activity only with cerebral death. The continuity, from the conception of the body to the destruction of its somato-psychic unity, renews the definition of per-

sonal history. Being born incomplete and indeterminate, the human body has to incorporate the information coming from its environment. This incorporation consists in a progressive determination throughout learning. Genetic inheritance defines the structures and modes of the human body functions.

But the opposition between innate and acquired becomes meaningless when no potentiality becomes necessarily actual. The human body finds a form between personal identity and social existence. Plasticity of the brain structures makes it possible: it would be wrong to think eyes see immediately and naturally since David Hubel (1988) and his experiments with Torse Wiesel prove that it is the interaction of light with visual neurons which makes us see the world. Otherwise, the human body loses the capacity of sight it has potentially in itself.

Nothing is naturally acquired. Human nature has to experience the world in order to *qualify (AQ)*. The neurobiology of development, a new version of "the man without qualities," gives to the human subject the freedom of building itself up. But this construction turns out to be definitive: the initial plasticity loses its suppleness with the myelenisation of nervous fibers (Spemann H., 1938) which preserves the information of successive incorporations.

Language learning is a good example of this preserving specialization. From intra-uterine life (Ph. Evrard, A. Minkowski, 1989), the human body hears sounds to which it reacts by movements at birth; its relatives speak to it in a language whose sound quality becomes more and more specific to the ear. Then language mastery (B. de Boysson-Bardies, S. de Schonen, P. Jusczyk, P. MacNeilage & J. Morton, eds., 1993) is reached with the indefinite repetition of the babble in which syllables are associated together. Language, as conventional support between the signifying and the signified, will be recognized at the end of this specialization. Each child must lose an incredible linguistic potential when he becomes a French or an English speaker. As he doesn't remain a polyglot, the human body can't express itself without the language it kept on incorporating during the early years (J. Mehler, Bertoncini J., Barrière M. & Jassik-Gershenfeld D., 1978).

It would be futile to limit the forming of the human body only to the biological progress from childhood to adulthood. Throughout its life, the human body keeps having dynamic interactions with its environment. The quantitative development of the brain does not last more than the first quarter of our biological life, yet the brain goes on receiving information from its body. This information creates new connections between the dif-

ferent brain areas so that it increases the complexity of memory. Even if the clinical descriptions of lesions fail to identify all the mnesic contents, P. Broca taught us how much the state of the body determines the state of the brain and conversely. The brain incorporates what the body individualizes. This double movement of incorporation of the world and of individualization of the body can be understood only from a conception of living matter.

Incorporation and individuation

Any nervous lesion prevents the brain from using what it has incorporated. It causes a loss of identity as well as a functional imbalance. As a disease weakens the body, the neurofunctional lesion prevents the subject from exercising his cognitive autonomy. As long as the brain provides the body with the means of its individuation, the authority called subject gets the conditions of its exercise: then consciousness is freed thanks to the proper functioning of the brain.

However, contrary to what those who support the notion of *neuronal man* (J.-P. Changeux, 1983) think, the content of thought can't be completely determined by the matter of its brain. We may refuse to consider the brain as the organ of thought, but we can't separate thought from its neurophysiological conditions of activity. It would be a mistake to consider brain and consciousness as opposites, like matter and thought, and fail to see the *embodied* link which holds them together. The distinction between levels of functioning must not hide the representation and/or cause one to believe in the scattering of the body.

The human body has been scattered and reduced by the human sciences which have studied it. The body gives its brain sufficient information to enable it to embody its representations and feelings, and derives its role as the main mediator as much from its phylogenesis as from its ontogenesis. With its phylogenesis, the body can genetically use specializations transmitted since the beginning of human mind. The succession of species made our body better and better adapted to its surroundings. In the absence of instinct, technique had to provide the means of replacing natural surroundings by an environment. This evolution has freed the body from servitudes in making the cerebral organization complex enough to think this freeing. Nature has produced a species likely to become completely cultural, including as genetics and procreatics prove it in the production of its own body.

As far as ontogenesis is concerned, each human body is singular even if the individual shares the same genetic inheritance with the other members of

the species. The proteic synthesis of our genes is so peculiar that no individual is identical. Helped by these singularities, each human body incorporates every experience. So the flesh of the human body could be defined as the sum of all these experiences, forming many layers, networks and intertwinings. The brain, being incorporated, can't resist this subjective construction of the matter: it takes the form of its body (N. Le Douarin, 1982).

But during its construction, the brain in turn determines the body (D. Purves, 1988). This permanent retroaction provides a reciprocal limitation to the brain and to the body. So the flesh of the body chooses its modes of constitution and its possibilities of incarnation. Incarnation is no longer the appearance of the mind in the matter but the expression in the body and by the body of its constituent layers. Either memory is stimulated by the presence of something known, or creative imagination is activated by the absence of something experienced. Our body, always present in the world by its senses, conceals a great number of signs to be discovered. Out of its prospect, this body is understood today as an indifferent neutral matter. Yet the human body becomes such only if it manages to incorporate its history. We only know the outer world by means of our body.

The role of the body

During its construction, the brain, following the model of interaction rather than the internal model of emergence, defines its plasticity according to the cultural forms which determine the body. The brain has a singular flesh for each human body. Even if the natural elements are determined by the genetic inheritance, the natural surroundings have to actualize and direct the plastic potentialities of the brain in construction. This singular development gives the human body the role of a determining, the translation of which will be effective in the neurobiological data. Then the nervous messages would not be prior to the esthesiologic activity of the body. The brain is not the condition of the body. It would mean mixing up cause and effect. There is no neurobiological basis to corporeal consciousness since as soon as intra-uterine life, it is the relation of the body with the world which informs, directs and selects the nervous networks and circuits. If the human being is born with an incomplete brain, it is precisely so that culture may be the necessary element of its qualification. The neurobiology of development refuses to link the corporeal consciousness to the result of brain activity.

The body is a mediator (R. Barbaras, 1999, 529-230) because it informs the brain about sensitive data, because it conveys the communications of the mind/brain, because it expresses a relational affectivity with its sociocultural environment. The physiological or psychoaffective state of the body depends of course on hormones, on the quantities of active neuronal networks, on the quality of its genetic code. But the difference between an animal body and human body lies in the capacity of the latter to acquire learnings which modify the consciousness of itself. The link between the unconscious and memory is founded in the brain which records and reorganizes the representations in as many neuronal associations. Of course the dream is the warden of brain individuation but the historical involvement of a subject in the world is more than the deterministic result of endocrine hormones.

So the human body is a place of conversion: it means that its form retro-acts upon its matter. In the same way, its matter determines indefinitely its forming. So we must distinguish several subjective levels in order to understand, if not objectively explain, the modes of relations with the brain. Dualism as a real distinction of substances can't subsist for it admits the relations only in intersection. A difference of degree is necessary, where each level corresponds to a level of representation for the human subject.

So the unconscious is the subject's intimate representation which can be modified by the brain/mind with psychoanalysis or because of physiological damages. The human being's brain/mind enables him to represent himself and develop representation by giving the thought a material support during the subject's activity. The flesh (D. Enns, 1995) is a dimension of affectivity where feelings and imagination feed the subject's experience in the singularity of its geohistory. The body proper is the image of the body, resulting from the narcissistic representation of the subject such as he sees himself or represents himself through others. The objective body is this exterior body, visible surface for others, organism objectified by the mechanisms of techno-science (H.L. Dreyfus, 2000). The world is not in front of the subject because the subject is a being in the world.

The consciousness of the brain

The dualistic tradition has always supported the opposition between mind and body: as the seat of thought, the mind had to maintain the communication with the world to find a meaning. Except for this allotted role, the body was not important: even the passions of the soul found in animal

minds a mechanically determined matter. So the brain couldn't be understood otherwise than as an organ of the body. Descartes, who discovered the *cogito*, granted the brain the pineal gland in order to maintain the minimum communication between body and mind. The failure of subjective idealism is due to the substantial isolation of the *res cogitans*. And Denis Kambouchner (1995) shows that Descartes, in his 1649 treatise *The Passions of the Soul*, had to grant the body not only the determinism of animal but also modes of series of objective and functional operations.

Though medical description has found in biology its means of objectifying the body, it would be ignorant to believe in functional monotypy. The biology of development takes the relational modes of the human body so much into account that it considers interaction as a structuration mode by incorporation. Thus, though not completely subjective, as Michel Henry (1999) thinks, the human body biopsychologically builds its flesh. Each body is this historical flesh, whose etiology has been embodied and shaped by the interaction with environment. By its character yet to be determined rather than undetermined, the human body contains all its history at the end of life. If its matter is marked with traces, scars and symptoms, the exhaustion of the flesh is nevertheless translated into the modes of symbolic expression. As Jean-Louis Chrétien (1990) shows, tiredness, as ontological condition of embodied being, comes from the indefinite gap between the human body and its flesh, a gap so wide it can never be filled.

Yet the fault of this mechanical model is the lack of mutual determination of mind and body. The birth of biology at the beginning of the twentieth century put natural surroundings in between: the surroundings have become the environment in which the body has to develop. Rather than defined as a creature, the human body must build itself in a double way: on the one hand, it is a natural product finding in physical development the means of acquiring a consciousness of itself, and on the other hand it is a cultural result incorporating all the information from its environment and thus increasing its degree of consciousness. The human body can't remain indifferent to this double determination.

Consciousness can't be completely separated from the brain (D.C. Dennett, 1991) because the human body builds cerebral connections in establishing the sensitive qualities of information which will be coded by the brain. The brain's organization in two hemispheres, presented by many as a split brain, doesn't eliminate the unity of consciousness. Through the studies of lesions of the callous body linking up the two hemispheres, split

brain specialists have shown how much this cognitive lateralization owed to neurofunctional specialization. The wish to *explain* consciousness rather than *describe* its activity derives its legitimacy from the progress of the neurosciences. For this purpose, however, consciousness should have to be reduced to its neurobiological conditions, since the slightest failure modifies the state of consciousness. And here is the main logical fault of this argument: from the clinical acknowledgement of the link between lesion and state of consciousness, one induces the necessary connection between brain and matter, thus disqualifying consciousness. Memory would be a succession of engrammes and programmes, perception would come to neuronal networks of vision, imagination would have to create new networks, and desire would find its modes of regulation in the hormonal system.

To cope with this drifting, cognitive scientists have been tempted to keep mental states of consciousness apart from neurobiological states of the brain, which may be a temporary solution. For supporters of cognitivism, mental states describe consciousness' activities enough to be the specifically human level. This new humanism has however ignored the neurosciences, renewing the phenomenological reflection on consciousness. Neurophilosophers took advantage of this isolation to develop with hardly any real opposition, a cerebral definition of consciousness. The alternative between cognitivists and neurophilosophers isn't based on a debate but on the mutual exclusion of points of view. Then how can we give the brain the material principles of consciousness while acknowledging that the latter has its own level of activity? This research, which can only be worked out in a dynamic conception of matter, doesn't really aim at what is scientifically correct but at the description of the different levels of human embodiment.

Though I grant that corporeal matter is the seat of the complex differentiation of these levels, I feel that we must recognize that the brain has a determining importance in the activity of consciousness. As all human brains are the product of body/environment interaction (S. Todes, 2001), consciousness then produced will be able to incarnate the incorporated neuronal networks. But this incarnation, the successive layers of which amount to its phenomenology, is an autonomous field in which consciousness carries on its subjective activity. The objective determination of the incorporated brain remains influential through the quality of mental images according to the variability of its neuronal networks.

Conclusion: The interactionist thesis

This change from the brain of consciousness, which makes it relative, to consciousness of the brain, which makes it believe in its subjective independence, proves how much brain and consciousness are complementary. As brain of consciousness, the incorporated brain provides information and ways to become conscious. Then this develops the consciousness of the brain by determining the brain in order to achieve the cognitive command of the thought:

Thought
autonomy of consciousness

Brain of Consciousness — Consciousness of the Brain

Incorporated brain
Body in the world
Environment

This dialectical movement from the brain of consciousness to the consciousness of the brain doesn't prevent consciousness from operating its own reflection: the process of thought. Thought is different from the consciousness of the brain due to its functional autonomy: the mental state is able to have a singular activity whereas the consciousness of the brain orders the brain to fulfill the orders of the will. With the consciousness of the brain, the human body reflexively thinks itself, thereby forgetting the relative autonomy of the thinking consciousness from the brain of consciousness.

Thought turns real autonomy into a subjective independence, producing mental states such as dreaming, imagination, ideation, representation and intentionality. From the subject's point of view, his thought is free because he can no longer see the determinism of the brain of consciousness. His power on the body, through the means of the consciousness of the brain, holds him in the illusion of his spiritual power on the matter. But from the point of view of this matter, the modification of its states can always limit the exercise of this freedom.

Human thought is produced by human bodies, but thought believes in its freedom because of the natural illusion of forgetting its relative autonomy. Yet this illusion has a real power over the body. Reducing

thought and brain, neurophilosophy has chosen to deny this essentially human level of consciousness to institute a determinism where there is nothing but determination.

References

Ainley, A. 1997. The Invisible of the Flesh: Merleau-Ponty and Irigaray, *J. of the British Society for Phenomenology*, 28 (1): 20-29.

Andrieu, B. 1993. L*e corps dispersé. Une histoire du corps au XXe siècle*, Paris: L'Harmattan,3d ed 2000.

_____ 1998. *La neurophilosophie*, Paris: P.U.F.

_____, 2002. *La chair du cerveau. Phénoménologie et biologie de la cognition*, Belgique: Ed. Sils-Maria.

_____, 2003. *Le cerveau psychologique, Histoires et Modèles*, Paris: Ed. CNRS.

Ashbaugt, A.F. 1978. The Philosophy of the Flesh and the Flesh of Philosophy, *Res. Phenomenology,* 8: 217-223.

Barbaras, R., 1999. The Movement of the Living as the Originary Foundation of Perceptual Intentionality, trans. C.T. Wolfe, in J. Petitot, F.J. Varela, B. Pachoud, J.M. Roy, (eds)., *Naturalizing phenomenology. Issues in Contemporary Phenomenology and Cognitive Science,* pp. 525-538. Stanford: Stanford U.P.

Borrett, D., Kelly, S., Kwan, H., 2000. Bridging Embodied Cognition and Brain Function: the Role of Phenomenology, *Phil.Psych,* 13, 2: 261-266.

Boysson-Bardies, B., de Schonen, S., Jusczyk P., MacNeilage P.and Morton J, eds., 1993. *Developmental Neurocognition: Speech and Face Processing in the First Year of Life,* Dordrecht: Kluwer Academic Publishers.

Changeux, J.P. 1983. *L'Homme neuronal,* Paris: Fayard.

Churchland, P.S. 1986. *Neurophilosophy. Toward a Unified Science of Mind-Brain,* Cambridge: M.I.T. Press.

Chrétien, J.L. 1990. *La Voix nue. Phénoménologie de la promesse,* Paris: Ed. Minuit

Damasio, A.R. 1994. *Descartes's Error. Emotion, Reason and the Human Brain*, A. Grosset/Putnam Books.

Damasio, A.R. 1999. *The Feeling of What Happens. Body and Emotion in the Making of Consciousness*, N.Y: Harcourt Brace & Compagny.

Davies, M. 2000. Interaction without reduction: The Relationship

between Personal and Subpersonal Levels of Description, *Mind & Society,* 2, vol. 1: 87-105.

Dennett, D.C. 1991. *Consciousness Explained,* Little, Brown & Compagny.

Dreyfus, H.L. 2000. A Merleau-Pontyian Critique of Husserl's and Searle's Representationalist Accounts of Action, *Proc. Aris. Soc.,* 100: 287-302.

Edelmann, G. 1987. *Neural Darwinism: The Theory of Neuronal Group Selection,* N.Y.: Basic Books.

Enns, D. 1995, "We Flesh": Re-membering the Body Beloved, *Philosophy Today Celina,* 39, 3: 263-279.

Evans F., Lawlor L. (eds). 2000. *Merleau-Ponty's Notion of Flesh*, Albany: Suny Press.

Evrard, P., Minkowski, A., 1989. *Developmental Neurobiology,* Raven Press.

Gold, I., Stoljar, D. 1999. A Neuron Doctrine in the Philosophy of Neuroscience, *BBS*, vol. 22: 809-830.

Harisson, P.J. 1991. Are Mental States a Useful Concept? Neurophilosophical Influences on Phenomenology and Psychopathology, *J. Nerv. Ment. Dis.,* Jun, 179, 6: 309-316.

Heinämaa, S. 1999. Merleau-Ponty's Modification of Phenomenology: Cognition, Passion and Philosophy, *Synthese* 118: 49-68.

Henry, M. 1999. *Incarnation,* Paris: Le Seuil.

Hubel, D., 1988. *The Eye, The Brain and the Vision*, Scientific American Book.

Jacob F., 1970, *La logique du vivant. Une histoire de l'hérédité*, Paris, Gallimard. (Eng. trans. *The Logic of Life*)

Kambouchner, D. 1995: *L'Homme des passions. Commentaires sur Descartes*, Paris: Albin Michel, 2 vols.

Lecanuet, J.P., Fifer, W.P., Krasnegor, N.A. (eds.), 1995, *Fetal Development: A Psychobiological Perspective*, Hillsdale, NJ: Lawrence Erlbaum Associate Publishers.

Le Douarin, N. 1982. *The Neural Crest*, Cambridge University Press.

Lefort C. 1991. Flesh and Otherness, in Johnson Galen A.(ed.), *Ontology and Alterity in Merleau Ponty*, pp. 3-13. Evanston: Northwestern Univ. Pr.

Lever, D. 1990. Flesh and Blood: A Proposed Supplement to Merleau-Ponty, *Human Stud.*, 13, 3: 209-219.

Mehler, J., Bertoncini, J., Barrière, M. and Jassik-Gershenfeld, D. 1978. Infant Recognition of Mother's Voice, *Perception,* 7: 491-497.

Mensch, J. 1994. The Mind-Body Problem: Phenomenological Reflections on an Ancient Solution, *Amer. Cath. Phil. Quart.*, 68, 1: 31-56.

Merleau-Ponty, M. [1945]. *Phenomenology of Perception,* Transl., 1962, London: Routledge & Kegan Paul.

Merleau-Ponty, M. 1995, *La Nature. Notes de cours du Collège de France,* Paris: Le Seuil.

Purves, D. 1988. *Body and Brain: A Trophic Theory of Neural Connections,* Harvard University Press.

Reuter, M. 1999. Merleau-Ponty's Notion of Pre-reflective Intentionality, *Synthese,* 118: 69-88.

Rochat, P. 2001. *The Infant's World*, The Developing Child Series, Harvard University Press.

Simondon, G. 1989. *L'individuation psychique et collective à la lumière des notions de Forme, Information, Potentiel et Métastabilité,* Paris: Aubier.

Smith, C. 2001. Renatus renatus: The Cartesian tradition in British Science and the Neurophilosophy of J. Carrew Eccles, *Brain Cognition,* Aug., 46, 3: 364-372.

Spemann, H. 1938. *Embryonic Development and Induction,* New Haven: Yale University Press.

Stent, G.S., Spicker, S.F. 1990. The Poverty of Neurophilosophy. Biological Research and Reality, *J. of Medecine and Philosophy,* 15,5: 539-557.

Todes, S. 2001, *Body and World,*Cambridge: MIT Press.

Varela, F. 1979, *Principles of Biological Autonomy,* Amsterdam: North Holland.

Varela, F., 1996, Neurophenomenology: A Methodological Remedy for the Hard Problem, *J. Consc. Studies,* 3: 330-350.

Varela, F., Thompson, E. and Rosch, E. 1991. *The Embodied Mind: Cognitive Science and Human Experience,* Cambridge: MIT Press.